

## **REMARKS/ARGUMENTS**

### **35 USC § 102(b)**

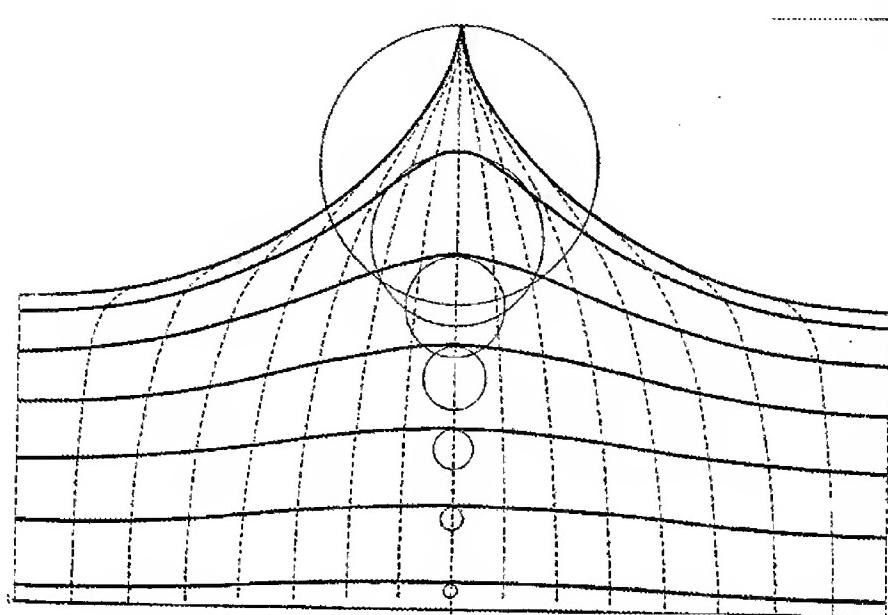
**Claims 1-16** were rejected under 35 USC § 102(b) as being anticipated by Danihel (U.S. Pat. No. 4,598,547). The applicant respectfully disagrees, especially in view of the amendments and arguments provided herein.

As amended herein, claim 1 expressly requires that the "...amplified element is rigidly coupled to a generator..." and "...has a fixed angle of attack throughout a wave cycle of a passing wave...". Similarly, amended claim 6 expressly requires that the hydrofoil element is "...rigidly coupled to the harvester to allow maintaining of a fixed angle of attack throughout a wave cycle of a passing wave...". Likewise, amended claim 11 specifically recites that the hydrofoil "...is rigidly coupled to the device such as to allow maintaining of a fixed angle of attack throughout a wave cycle of a passing wave..."

Support for the amendment is provided on page 5, lines 12-15, page 8, lines 11-12, and Figures 1A-1C and 2A-B. Moreover, support is also inherently provided in the corresponding description of the Figures, especially on page 5, lines 10-28. Here, the amplification of the up-and downward motion of the energy harvester necessarily flows from the maintained fixed angle of attack of the hydrofoil throughout the wave cycle of a passing wave. The applicant notes that "...if a skilled artisan would have understood the inventor to be in possession of the claimed invention at the time of filing, even if every nuance of the claims is not explicitly described in the specification, then the adequate description requirement is met..." *Vas-Cath*, 935 F.2d at 1563, 19 USPQ2d at 1116; *Martin v. Johnson*, 454 F.2d 746, 751, 172 USPQ 391, 395 (CCPA 1972) (stating "the description need not be in *ipsis verbis* to be sufficient"). See also MPEP 2163 II.3(a).

In contrast, the angle of attack in Danihel's device (see esp. Fig. 2) continuously changes throughout the wave cycle as is detailed in column 5, lines 6-34. Here, it is particularly pointed out that the hydrofoil has no angular deviation from horizontal at the peak and the trough of the wave, and the largest deviation in a position intermediate the peak and trough. Such difference is far from trivial as can be taken from the following.

A water wave can be viewed as an epiphenomenon of a rotational movement of water molecules in the vertical plane along the direction of movement: The wave appears to progress past a fixed point in the water. However, the water molecules at that point move up and down, forwards and back, with little net motion. This is demonstrated in the classic illustration below from Gerstner in Prague in 1802 and reproduced in Lambs' Hydrodynamics Sect 251 (1922).

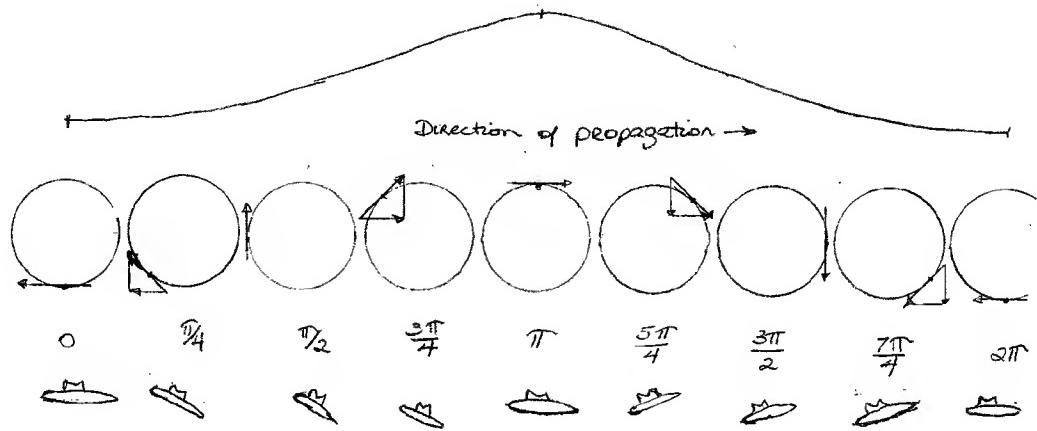


The relationship of a circular motion and the sine wave is apparent, as the sine wave is simply the trace of a point on a circle as it is translated by its center. The tangent of the circle at that point is the direction of the particles movement, or the velocity of the water. Consequently, it should be appreciated that the horizontal motion of the water molecules in the wave is greatest at the top and bottom of the circle (wave cycle), corresponding to the peak and the trough of the wave.

*A fixed hydrofoil angled up in the direction of the waves approach will interact with this flow, thereby increasing upwards motion of the hydrofoil at the crest of the wave, and downwards motion in the trough of the wave, and this force amplifies the motion of the float, as presently claimed.*

By contrast, the angle of attack of the hydrofoils in Danihel varies in accord with whether they are being pulled upwards or pushed downwards through the water as can be taken from Fig.

2 and corresponding description on page 5 lines 6 to 34. As Danihel's float rises, the hydrofoils twist counterclockwise, *i.e.* the nose rises and the tail sinks and the angle of attack is positive, with an upwards force from horizontal motion of water coming towards the nose, or downwards force if the water is coming from the tail. Consider the diagram of a wave, the relative circular motion at points along the wave, and the angle and resulting forces on the Danihel hydrofoil.



At position  $\pi/4$ , the upwards motion begins and the angle of attack goes positive, but the horizontal direction of fluid flow is still negative, so the forces on the hydrofoil are downwards, resisting the upwards motion of the float. At position  $\pi/2$ , there is no horizontal motion of the water, so the forces on the hydrofoil are null. At position  $3\pi/4$ , the angle of attack is positive and the forces are upwards, but by the time the foil reaches the crest of the wave, the angle of attack has returned to neutral and there is no upwards force. The upwards force is diminishing between  $3\pi/4$  and  $\pi$ , so the angle is lessening while the float is still rising. ***As the hydrofoil angle of attack is null at the crest of the wave, forward movement of the water is not translated into any vertical motion. Consequently, the float position at the crest is the same as it would be without the hydrofoils of Danihel.*** Continuing through the rest of the wave, by position  $5\pi/4$ , the hydrofoil is pulling the float downwards, but this force declines to null at  $3\pi/2$  and then becomes an upwards force in the last section, resisting the downwards movement of the float. However, this force diminishes again to null as the float approaches the trough, resulting in no net displacement of the float and no amplification in terms of added power as presently claimed.

By contrast, hydrofoils of the claims have a fixed positive angle of attack. Therefore, at position 0, the force exerted by the hydrofoils is strongly downwards, pulling the float down below its buoyancy point and increasing it's downwards excursion. As the crest approaches, the force of the horizontal water flow is upwards, lifting the float out of the water and increasing its upwards excursion. The overall effect over the course of the wave is to amplify the up and down motion of the float, which is also the power stroke of the generator. Therefore, it should be recognized that the fixed hydrofoils increase the power production.

Consequently, in view of the above amendments and arguments, claims 1-16 should not be rejected under 35 USC § 102(b) as being anticipated by Danihel.

### **35 USC § 103(a)**

**Claim 17** was rejected under 35 USC § 103(a) as being obvious over Danihel (U.S. Pat. No. 4,598,547) in view of Heck (U.S. Pat. No. 4,447,740). The applicant respectfully disagrees, especially in view of the amendments and arguments herein.

As claim 17 depends on amended claim 15, all of the defects and arguments as pointed out above apply and are not reiterated here. Heck fails to remedy these defects. While Heck does teach use of a turbine for energy production, such turbine is directly coupled to a buoyant element that fails to include an amplifier element as presently taught. Thus, claim 17 should not be deemed obvious over the cited art.

**Claims 18-20** were rejected under 35 USC § 103(a) as being obvious over Danihel (U.S. Pat. No. 4,598,547) in view of Houser (U.S. Pat. No. 5,411,377). The applicant respectfully disagrees.

Amended claim 18 is dependent on amended claim 15. All of the defects and arguments as pointed out above apply and are not reiterated here. Houser fails to remedy these defects, and the rejection of claim 18 should therefore be withdrawn. With respect to the combination of Danihel and Houser, it should be noted that amended claim 18 requires the energy harvester to have neutral buoyancy *during normal operation*. Such requirement is inconsistent with the operating principle of Danihel and would render the device of Danihel inoperable for its intended

purpose. For at least these reasons and amendments, the rejection of claim 18 should no longer be maintained.

Claims 19-21 were canceled, therefore the rejection of claims 19-21 is moot.

In view of the present amendments and arguments, the applicant believes that all claims are now in condition for allowance. Therefore, the applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,  
Fish & Associates, PC

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By: /Martin Fessenmaier/

Martin Fessenmaier, Ph.D.

Reg. No. 46697

Fish & Associates, PC  
2603 Main Street, Suite 1000  
Irvine, CA 92614-4271  
Telephone (949) 943-8300  
Fax (949) 943-8358